# THE READOUT OF THE LHC BEAM LUMINOSITY MONITOR: ACCURATE SHOWER ENERGY MEASUREMENTS AT A 40 MHz REPETITION RATE.

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## A B S T RA CT

The LHC beam luminosity monitor is based on the following principle. The neutrals that originate in LHC at every PP interaction create showers in the absorbers placed in front of the cryogenic separation dipoles. The shower energy, as it can be measured by suitable detectors in the absorbers is proportional to the number of neutral particles and, therefore, to the luminosity [1,2]. This principle lends itself to a luminosity measurement on a bunch-by-bunch basis. However, detector and front-end electronics must comply with extremely stringent requirements. To make the bunch-by-bunch measurement feasible, their speed of operation must match the 40 MHz bunch repetition rate of LHC . Besides, in the actual operation the detector must stand extremely high radiation doses. The front-end electronics, to survive, must be located at some distance from the region of highest radiation field, which means that a properly terminated, low-noise, cable connection is needed between detector and front-end electronics. After briefly reviewing the solutions that have been adopted for the detector and the front-end electronics and the results that have been obtained so far in tests on the beam, the latest version of the instrument is described in detail. It will be shown how a clever detector design, a suitable front-end conception based on the use of a "cold resistance" cable termination and a careful low-noise design, along with the use of an effective deconvolution algorithm, make the luminosity measurement possible on a bunch-by-bunch basis at the LHC bunch repetition rates.